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LIGHTHOUSE WORLDWIDE SOLUTIONS

DQS Inc. UL REGISTERED FIRM A2LA ACCREDITED CERT #4914.01

CALIBRATION CERTIFICATE

Certificate Number 44043200704044

Model:	S3100
Serial Number:	200704044
Sensor ID:	200704-041
Calibration Location:	1221 Disk Drive, Medford, OR 97501
Date of Calibration	July 31, 2020
Next calibration on this instrument is due:	July 31, 2021
Calibration Method	Calibration of this instrument has been accomplished as defined in ISO 21501-4 2018: Light scattering airborne particle counter for clean spaces. All work performed is in accordance with Lighthouse Worldwide Solutions. Quality Manual P/N 714252800-1. Reproduction of this certificate and accompanying documentation is prohibited without the expressed written permission of Lighthouse Worldwide Solutions. All records of work performed are maintained by Lighthouse Worldwide Solutions.
Traceability	The Standards of the Compliant Calibration Laboratory are traceable to the International System of Units (SI) through the National Institute of Standards and Technology, and are part of a comprehensive measurement assurance program for ensuring continued accuracy and measurement traceability within the level of uncertainty reported by this laboratory. The unique laboratory calibration number identified above shall be used in referencing metrological traceability for artifacts identified only in this certificate.
Uncertainty	The reported uncertainty is based on a standard uncertainty multiplied by a coverage factor of k = 2, which provides a confidence level of approximately 95%. The values and test criteria are applied using Simple Acceptance; Shared Risk approach.
Results	This certifies the above named instrument conforms to the original specifications in effect at date of manufacture and test.
Environmental Conditions	Ambient temperature 72.0 °F Relative humidity 44.0 %

Test Equipment

Standards	Model	Mfg	Serial#	Cal Date	Cal Due
Flow meter	4043	TSI	40431722011	12/27/2019	9/27/2020
DMM	Fluke 179	Fluke	32030104	4/7/2020	4/7/2021
MCA	8000D	Amptek	994	3/10/2020	3/10/2021
Test Standard	Solair	LWS	100539006	2/20/2020	8/21/2020

Particle Size Standards

Nominal Size	Particle Size	Tolerance (nm)	Lot No.	Manufacturer	Expiration Date
0.30µm	0.30µm	+/-3	219211	Thermo Scientific	11/30/2022
0.40µm	0.40µm	+/-3	211099	Thermo Scientific	4/30/2022
0.50µm	0.51µm	+/-3.5	218477	Thermo Scientific	10/1/2022
1.00µm	1.04µm	+/-6	215612	Thermo Scientific	8/31/2022
3.00µm	2.92µm	+/-15	199811	Thermo Scientific	3/1/2023
5.00µm	5.02µm	+/-20	214744	Thermo Scientific	7/1/2022
10.00µm	9.99µm	+/-80	221642	Thermo Scientific	10/31/2021

Counting Efficiency Particle Size Standards

Nominal Size	Particle Size	Tolerance (nm)	Lot No.	Manufacturer	Expiration Date
0.30µm	0.30µm	+/-3	219211	Thermo Scientific	11/30/2022
0.50µm	0.51µm	+/-3.5	218477	Thermo Scientific	10/1/2022

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CALIBRATION RESULTS AS LEFT

Certificate Number 44043200704044

Size Calibrations as Left

Channel	Chnl Size	Threshold	Particle Size	Particle Size Voltage	Expanded Uncertainty	As Left Size Error
1	0.30µm	51mV	0.303µm	52.0mV	0.009 µm	0%
2	0.50µm	487mV	0.510µm	510.0mV	0.01 µm	0%
3	1.00µm	1105mV	1.036µm	1147.0mV	0.014 µm	0%
4	3.00µm	3246mV	2.920µm	3220.0mV	0.033 µm	0%
5	5.00µm	3750mV	5.020µm	3756.0mV	0.04 µm	0%
6	10.00µm	4613mV	9.990µm	4613.0mV	0.168 µm	0%

Measurements as Left

Nominal Flow Rate:	Measured Flow:		Expanded Uncertainty	Result
28.30 LPM	28.71 LPM	(limit ±5% of nominal)	0.8L/min	Pass

False Count Rate:

JIS B 9921 Zero Count	Observed Cts:	0	(≤ 1 ct max / 5 min.)		Pass
ISO21501-4 False Count Rate	Observed Cts:	0	Upper confidence level	2	Particles/m3

Counting Efficiency 50%:				Expanded Uncertainty	Result
Size	0.303 µm	49.5%	(limit 30% - 70%)	3.4 %	Pass
Counting Efficiency 100%:					
Size	0.51 µm	96.7%	(limit 90% - 110%)	4.7 %	Pass

Size Resolution:					
Size	0.401 µm	5.39%	(limit 15%)	1.6 %	Pass

LIGHTHOUSE WORLDWIDE SOLUTIONS

DQS Inc. UL REGISTERED FIRM A2LA ACCREDITED CERT #4914.01

CALIBRATION RESULTS AS FOUND

Certificate Number 44043200704044

Size Calibrations as Found

Channel	Size(µm)	As Rec'd Threshold Settings mV	As measured Threshold Settings mV	As Rec'd size (µm)	Percent size error (%)	Percent size error tolerance	Expanded Uncertainty	Pass/Fail
1	0.3	51	51	0.300	0.0%	+/- 10%	0.009 µm	Pass
2	0.5	487	487	0.499	-0.2%	+/- 10%	0.01 µm	Pass
3	1	1105	1105	0.998	-0.2%	+/-10%	0.014 µm	Pass
4	3	3246	3246	2.984	-0.5%	+/-10%	0.033 µm	Pass
5	5	3750	3750	4.991	-0.2%	+/-10%	0.04 µm	Pass
6	10	4613	4613	9.989	-0.1%	+/-10%	0.168 µm	Pass

Measurements as Found

Nominal Flow Rate:	Measured Flow:		Expanded Uncertainty	Result
28.30 LPM	28.71 LPM	(limit ±5% of nominal)	0.8L/min	Pass

False Count Rate:

JIS B 9921 Zero Count	Observed Cts:	0	(≤ 1 ct max / 5 min.)		Pass
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Size	0.303 µm	49.5%	(limit 30% - 70%)	3.4	%	Pass
Counting Efficiency 100%:						
Size	0.51 µm	96.7%	(limit 90% - 110%)	4.7	%	Pass

Size Resolution:

Size	0.401 µm	5.39%	(limit 15%)	1.6	% Pass

Signature: _____
Head of Calibration: D. Spranger

Head of calibration acknowledges that the calibration has been carried out in accordance with ISO 17025:2017 and Lighthouse Worldwide Solutions ISO 17025 Quality Management system to comply to ISO 21501-4:2018 calibration requirements.

Signature: _____
Calibration Tech/Engineer: T Kish